RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 3 - Advanced Technology Development

PE NUMBER AND TITLE: 0603253F Advanced Sensor Integration

	COST *($ In Thousands)*	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
	Total Program Element (PE) Cost	11,825	10,462	9,443	11,984	13,043	13,677	13,516	13,343	Continuing	Continuing
2735	Avionics Integration Technology	5,696	5,974	5,976	6,796	6,945	7,443	7,174	7,085	Continuing	Continuing
3833	Integrated Avionics for Aging Aircraft	2,349	0	0	0	0	0	0	0	Continuing	Continuing
666A	Reference and Information Transmission Technology	3,780	4,488	3,467	5,188	6,098	6,234	6,342	6,258	Continuing	Continuing
	Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	0

Note: In FYs 1999 and out, Project 3833 transferred into Project 2735.

(U) A. Mission Description: This Advanced Technology Development program develops and demonstrates advanced radio frequency sensors for performing integrated intelligence, surveillance, and reconnaissance functions. Specificially, this program develops and improves: digital receiver components for space-based radar and advanced unmanned aerial vehicle applications; advanced Global Positioning System receivers and anti-jam techniques for aerospace platforms; aircraft communications, navigation, and identification technologies; technologies for low-probability-of-detection communication between aircraft to improve aircrew situation awareness; and collaborative engineering environments to evaluate the integration of on-board and off-board sensor data.

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(U) B. Budget Activity Justification: This program is in Budget Activity 3, Advanced Technology Development, since it develops and demonstrates technologies for existing system upgrades and/or new sensor and electronic combat system developments that have military utility and address warfighter needs.

(U) C. Program Change Summary ($ in Thousands):

	FY 1998	FY 1999	FY 2000	FY 2001	Total Cost
(U) Previous President's Budget/FY 1999 PB	12,012	10,536	8,747	10,796	Cont
(U) Appropriated Value	12,716	10,536			
(U) Adjustments to Appropriated Value					
a. Congressional/General Reductions	-422	-74			
b. SBIR	-290				
c. Omnibus/Other Above Threshold Reprogrammings	-81				
d. Below Threshold Reprogrammings	-98				
(U) Adjustments to Budget Year Since FY 1999 PB			696	1,188	
(U) Current Budget Submit/FY 2000 PB	11,825	10,462	9,443	11,984	Cont

(U) Significant Program Changes: Not Applicable.

FY 1999: $233 identified as a source for SBIR.

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BUDGET ACTIVITY: 3 - Advanced Technology Development	PE NUMBER AND TITLE: 0603253F Advanced Sensor Integration	PROJECT: 2735

COST *($ In Thousands)*	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
2735 Avionics Integration Technology	5,696	5,974	5,976	6,796	6,945	7,443	7,174	7,085	Continuing	Continuing

(U) A. Mission Description: Develops and demonstrates advanced radio frequency sensors for integrated intelligence, surveillance, and reconnaissance functions on aerospace platforms. These advanced technologies will enable sensors to gather and process information from air- and space-based assets, integrate on-board and off-board sensors, and perform sensor management functions.

(U) FY 1998 ($ in Thousands):

- (U) $3,902 Developed and demonstrated advanced modular, sharable radio frequency (RF) sensor processing technologies to provide for avionics cost and weight savings, improved reliability, and increased sensor data fusion opportunities. This included integration of components for demonstrating integrated sensor system technology for simultaneously performing radar, electronic warfare (EW), communication, navigation, and identification functions.
- (U) $1,228 Developed integrated avionics architecture components which leverage prior technology developments and incorporate additional user requirements for multi-platform commonality, open system architecture compliance, standard high-level software language, affordability, and expandability. This included flight demonstrations of low-level covert penetration capability and demonstration of improved threat location.
- (U) $566 Developed architectural components required to convert RF functions (radar, EW, communications) from bulky, analog electronics to more compact, reliable digital technology which provides significant cost/performance payoffs, including assessment of commercial developments.
- (U) $5,696 Total

(U) FY 1999 ($ in Thousands):

- (U) $3,936 Develop and demonstrate advanced modular, sharable RF sensor processor technologies to provide for avionics cost and weight savings, increased multimission capability, improved reliability, and increased sensor data fusion opportunities. This includes demonstrating integrated sensor system technology for simultaneously performing radar, EW, communication, navigation, and identification functions.
- (U) $500 Develop technologies for collecting and integrating sensor data from various sources in a collaborative engineering environment in order to reduce risks and costs of advanced technology demonstration and to enable faster transition of affordable technology to meet warfighter needs, including developing a collaborative engineering capability and evaluating sensor data in a collaborative environment.

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- (U) $1,405 Develop and demonstrate technologies to support maximum use of existing avionics software in concert with newly developed software in a real-time avionics environment, thereby providing a cost-effective incremental upgrade capability, including optimizing testing of technology for simultaneous execution of existing 16-bit avionics software with 32-bit application software and develop preliminary architectural framework. (In FY 1999, this work transferred from Project 3833, Integrated Avionics for Aging Aircraft.)
- (U) $133 Identified as a source for SBIR.
- (U) $5,974 Total

(U) FY 2000 ($ in Thousands):

- (U) $1,867 Develop and demonstrate advanced modular, sharable radio frequency (RF) sensor technologies for aerospace sensor suites performing intelligence, reconnaissance, and surveillance applications. This includes designing a dual-use modular, digital RF receiver and conducting trade studies for space-based radar components.
- (U) $2,482 Develop technologies for collecting and integrating on- and off-board sensors over multiple platforms in a collaborative engineering environment, reducing cost and risk of advanced technology demonstration. This includes evaluating on-board and off-board sensors and multiple platforms in a collaborative engineering environment.
- (U) $444 Develop and demonstrate technologies to support maximum use of existing avionics software together with new software in real-time environments, including transitioning these technologies to fighter and transport aircraft.
- (U) $1,183 Develop and demonstrate advanced architecture concepts to support seamless information flow and fusion for application in space and unmanned aerial vehicles (UAVs), including developing UAV architecture concepts applicable to multiple UAV applications and developing an Assured Space Access Architecture (ASAA) for the space maneuver vehicle as well as the command and control (C2) information infrastructure needed for ASAA.
- (U) $5,976 Total

(U) FY 2001 ($ in Thousands):

- (U) $3,095 Develop and demonstrate advanced modular, sharable digital RF sensor technologies for aerospace sensor suites performing intelligence, reconnaissance, and surveillance applications. This includes completing the design and initiating fabrication of dual-use, modular, digital RF receiver components for space-based radar.
- (U) $2,261 Develop technologies for collecting and integrating network-centric sensor data in collaborative engineering environment in order to reduce risk of transitioning advanced technology.
- (U) $1,440 Develop and demonstrate advanced architecture concepts to support seamless information flow and fusion for application in space and UAVs, including demonstrating UAV and space maneuvering vehicle architecture and C2 strategy and assessing performance, reliability, and affordability.
- (U) $6,796 Total

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(U) B. Project Change Summary - Description of Significant Changes: Not Applicable.

(U) C. Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0603204F, Aerospace Sensors.
- (U) PE 0603203F, Advanced Aerospace Sensors.
- (U) PE 0603270F, Electronic Warfare Technology.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Acquisition Strategy: Not Applicable.

(U) E. Schedule Profile: Not Applicable.

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DATE: February 1999

BUDGET ACTIVITY: 3 - Advanced Technology Development

PE NUMBER AND TITLE: 0603253F Advanced Sensor Integration

PROJECT: 3833

COST *($ In Thousands)*	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
3833 Integrated Avionics for Aging Aircraft	2,349	0	0	0	0	0	0	0	Continuing	Continuing

(U) A. Mission Description: Develops and demonstrates affordable avionics technology to extend the useful life of Air Force aging aircraft and provide the flexibility and supportability needed to support worldwide operations with reduced force structure. This project focuses on technologies to support transition of modular avionics, commercially available products, and commercial open system standards for cost-effective retrofit of user-required upgrades to existing avionics systems. In FY 1999 and out, this project transfers to Project 2735.

(U) FY 1998 ($ in Thousands):

- (U) $388 Developed and demonstrated programmable integrated communications, navigation, and identification hardware/software modules for currently fielded aircraft applications to provide fleet wide commonality, attendant economies of scale, and increased platform availability.
- (U) $1,377 Developed and demonstrated technologies to support maximum use of existing avionics software in concert with newly developed software in a real-time avionics environment and, thereby, provide a cost-effective incremental upgrade capability.
- (U) $584 Developed avionics integration technologies to enable commercial-off-the-shelf components to function reliably in a combat aircraft environment for cost-effective modernization of aging avionics.
- (U) $2,349 Total

(U) FY 1999: Not Applicable.

(U) FY 2000: Not Applicable.

(U) FY 2001: Not Applicable.

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603253F Advanced Sensor Integration
	PROJECT 3833

(U) B. Project Change Summary - Description of Significant Changes: Not Applicable.

(U) C. Other Program Funding Summary ($ in Thousands):

(U) Related Activities:
- (U) PE 0602204F, Aerospace Sensors.
- (U) PE 0602301E, Intelligence System Program.
- (U) PE 0602232N, Navy Command, Control, and Communications (C3) Technology.
- (U) PE 0603203F, Advanced Aerospace Sensors.
- (U) PE 0604201F, Common Avionics.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Acquisition Strategy: Not Applicable.

(U) E. Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)	DATE February 1999
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603253F Advanced Sensor Integration PROJECT 666A

COST *($ In Thousands)*	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
666A Reference and Information Transmission Technology	3,780	4,488	3,467	5,188	6,098	6,234	6,342	6,258	Continuing	Continuing

(U) A. Mission Description: Develops and demonstrates the advanced reference and information transmission technologies required for precise navigation and targeting and reliable information links for future Air Force information architectures. Specifically, this projects develops the advanced techniques for exploiting and protecting the capabilities of the Global Positioning System (GPS) to provide highly accurate reference information for precision targeting and the precision location of enemy air defense radars. In addition, this project develops high-speed, jam-resistant, low-probability-of-detection information transmission technologies and techniques to improve overall aircrew situation awareness. These technologies will also reduce the electromagnetic signatures of navigation and communication systems, increasing aircraft survivability. The focus is on transitioning transceivers, intertial components, navigation system technology into air vehicles. Technologies demonstated under this project are needed for real-time information in the cockpit, stealth operations, precision targeting and strike, timely bomb damage assessment, force multiplication through multi-platform shared resources, and affordable and supporatable weapon systems.

(U) FY 1998 ($ in Thousands):

- (U) $2,409 Developed enhancements to GPS user equipment and system integration techniques to maximize position accuracy and jam resistance and exploit the benefits of GPS to improve offensive and defensive combat capabilities at reduced costs. This included completion of flight experiments for GPS-based rapid location and countering of emitters, development of optimum anti-jam techniques that fully exploit digital architectures, and development of precision attack techniques using improved GPS signals and all-digital user equipment.
- (U) $1,371 Developed multi-user, medium to high capacity, jam-resistant airborne network technology to provide for low probability of detection exchange of time-critical threat, sensor, and other information between aircraft and cooperative assets, including completion of a brassboard design and ground-tests of high-speed, high-bandwidth data transfer technology.
- (U) $3,780 Total

(U) FY 1999 ($ in Thousands):

- (U) $2,706 Develop enhancements to GPS user equipment and system integration techniques to maximize position accuracy and jam resistance and exploit the benefits of GPS to improve offensive and defensive combat capabilities at reduced costs. This includes continuing development of optimum anti-jam techniques and techniques for precision attack using improved GPS.
- (U) $1,682 Develop multi-user, medium to high capacity, jam-resistant airborne network technology to provide for low probability of detection exchange of time-critical threat, sensor, and other information between aircraft and cooperative assets, including completing the evaluation of a common, affordable, open system architecture for unmanned aerial vehicles.
- (U) $100 Identified as a source for SBIR.
- (U) $4,488 Total

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	PROJECT 666A

(U) FY 2000 ($ in Thousands):

- (U) $2,647 Develop technologies to maximize Global Positioning System (GPS) jam resistance, position accuracy, and exploitation techniques to improve offensive and defensive combat capabilities at reduced costs. This includes completing GPS space-time adaptive algorithms and trade studies and evaluating impacts of GPS signal modernization to legacy and research user equipment
- (U) $820 Develop and evaluate multi-user, medium to high capacity airborne platform information transfer technology to provide jam-resistant, lower probability of detection exchange of information between aircraft and cooperating space, airborne, and surface communication assets. This includes fabrication of a space-based air traffic communications and positioning brassboard.
- (U) $3,467 Total

(U) FY 2001 ($ in Thousands):

- (U) $4,301 Develop technologies to maximize GPS jam resistance, position accuracy, and exploitation techniques to improve offensive and defensive combat capabilities at reduced costs, including integrating algorithms and receiver processor techniques and developing direct acquisition techniques to improve delivery of precision munitions.
- (U) $887 Develop technology to increase airborne platform information transfer capacity while providing jam-resistant, low probability of detection exchange of time-critical threat, sensor, and command and control information between aircraft and cooperating space, airborne, and surface communication assets, including developing advanced radio frequency switching and amplification technologies.
- (U) $5,188 Total

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	PROJECT 666A

(U) B. Project Change Summary - Description of Significant Changes: Not Applicable.

(U) C. Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0602204F, Aerospace Sensors.
- (U) PE 0602782A, Command, Control, and Communications (C3) Technology.
- (U) PE 0602232N, Navy C3 Technology.
- (U) PE 0603203F, Advanced Aerospace Sensors.
- (U) PE 0603270F, Electronic Combat Technology.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Acquisition Strategy: Not Applicable.

(U) E. Schedule Profile: Not Applicable.